

Just as houses are made of stone, so is science made of facts; but a pile of stones is not a house, and a collection of facts is not necessarily science.

Jules Henri Poincaré, French mathematician (1854–1912)

NATURAL RESOURCES

Arctic Oil Drilling Plans Raise Environmental Health Concerns

As Royal Dutch Shell and other oil companies prepare to drill offshore in the Alaskan Outer Continental Shelf (OCS), a new report commissioned by the Washington, DC-based Pew Environment Group concludes current response capabilities aren't adequate to contain and clean up a major spill in the area.¹ Marilyn Heiman, who

directs the group's U.S. Arctic program, says drilling on the Alaskan OCS requires a science-based precautionary approach. "And right now, we don't know enough about the potential consequences of a spill to the ecosystem," she says.

Chuck Clusen, director of the national parks and Alaska projects at the Natural Resources Defense Council, says that by aggregating the technical concerns associated with offshore Arctic oil and gas activities, the report provides a much-needed resource for officials and the public. "The issues it raises need to be addressed before any further oil and gas activities go forward," he says.

The report states emphatically that spill prevention and response must fit Arctic-specific risks. Where extreme depths are the primary challenge for offshore drilling in the Gulf of Mexico, drilling and spill cleanup in the OCS will be challenged by ice cover, subzero temperatures, and harsh weather. Many environmentalists are concerned industrial drilling operations could threaten or harass the region's wildlife, including bowhead whales. Moreover, Alaska Native populations that rely in part on marine mammals for subsistence could be affected if those mammals move farther offshore to avoid boat traffic. Spilled oil, meanwhile, persists much longer in Arctic



Ice-breaking ships, described as "huge beasts of the ocean," may contribute as much as 90% of air emissions from offshore oil and gas exploration—although the choice of fuel used in the ships can make a significant difference.

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waters than in warmer seas; microbes are slow to degrade oil under cold conditions, and the oil's most toxic fractions—namely, benzene, toluene, ethylbenzene, and xylene—can persist for long durations before evaporating, posing risks to aquatic species, according to Ronald Atlas, a professor of biology at the University of Louisville. Shell plans to drill during the “open-water” season, which lasts approximately from June through late October. After that, the OCS begins to freeze over.

According to experts cited in the Pew report, surface ice interferes with the booms, skimmers, and other tools used in mechanical oil recovery. Oil trapped under pack ice in the winter can't be accessed for *in situ* burning, the report states. What's more, Heiman says, “There's no proven response method for cleaning [up] an oil spill in the midst of broken ice. Shell says they've done studies that show you can do it, but those are under highly controlled experimental conditions. We have no idea what would happen in a real-world scenario.”

Officials with the Alaska region of the Bureau of Ocean Energy Management, Regulation, and Enforcement see things differently. They would not comment on the Pew report directly. But an agency official did describe Shell's plan—which includes an on-site oil spill response fleet, near-shore barges, and responders drawn partially from local oil cleanup companies,² including Alaska Clean Seas of Anchorage—as robust and well-rounded.

“They're prepared to use ice breakers to open up areas for skimming, and they have other methods for cleaning oil when the ice goes solid,” the official says. “For instance, they can drill through the ice, allow oil to rise to the surface for cleaning, and they can burn what's trapped in the ice later when the ice begins to melt.” The oil clings to the lower ice surface that touches the water and travels with the ice. When the ice melts, the oil is released.

The report does not address potential health risks from offshore oil development to indigenous populations, including the Inupiat Community of the Arctic Slope, an Alaska Native tribe. Jonathan Jemming, an environmental attorney in Salt Lake City, Utah, and former offshore counsel with the

North Slope Borough Law Department in Barrow, Alaska, says these groups already have disproportionately high rates of cardiovascular ailments, an Arctic reality he says has never been fully analyzed.

“We are also seeing higher concentrations of nitrogen dioxide and particulate matter on village air monitors, but we're not entirely sure where it's coming from,” Jemming says. “What native communities need is for the industry and the federal government to do comprehensive air modeling to determine who the contributors are and how much more [pollution] they can add without compromising the health of the Arctic people.”

Shell's drilling plans are now held up because of its offshore air emissions permit, which is under review by the U.S. Environmental Protection Agency (EPA). The permit had been approved by the EPA last year. But then the Inupiat Community of the Arctic Slope, the Alaskan Eskimo Whaling Commission, and several local environmental groups challenged the permit, arguing in part that it doesn't take into account the EPA's more stringent National Ambient Air Quality Standard for nitrogen dioxide, which was issued 9 February 2010.³ The EPA's Environmental Appeals Board—an independent review board within the agency—agreed and remanded the permit back to the agency on 30 December 2010.

On 3 February 2011, Pete Slaiby, vice president of Shell Alaska, announced the company's plan to drill during the summer of 2011 would be delayed until issues with its air permit could be resolved.⁴ Shell now hopes to begin drilling in 2012, Slaiby said during a press conference to announce the delay.

According to Jemming, ice-breaking ships—not the drill rigs themselves—are expected to contribute as much as 90% of air emissions from offshore oil and gas exploration. “These ships, especially older models, are huge beasts of the ocean,” he says. “And it takes a lot of propulsion to move the ice around.”

Stakeholders have argued about how much pollution those ships might release. Jemming claims the EPA's own analysis predicted that one season's exploration emissions could rival those generated by

3 million passenger automobiles a year. However, two years ago Shell committed to fuel ice-breakers with ultra-low sulfur diesel,⁵ a move Jemming says could greatly reduce the overall emission levels.

Meanwhile, on 11 January 2011 the National Commission on the BP *Deepwater Horizon* Oil Spill and Offshore Drilling, established by President Obama, released its final report.⁶ In the few of its more than 300 pages that were devoted specifically to Alaskan OCS drilling, the report reported an “optimistic” prediction by Shell that drilling in the region could ultimately peak at 1.8 million barrels per day. The commission cited numerous concerns also raised by the Pew Environment Group: hurricane-strength storms, ice, polar darkness,⁷ pervasive fog, and “serious questions about how to access spilled oil when the area is iced over or in seasonal slushy conditions.” Nevertheless, the report also stated that the need for additional research on how to manage these challenges should not pose a “*de-facto* moratorium on activity in the Arctic.”⁶

“If Shell is allowed to go forward and they strike significant amounts of oil, all the other companies are going to head up there full blast,” Clusen says. “And then the federal government is going to have to respond to a slew of requests and demands from the oil industry.”

Charles W. Schmidt, MS, an award-winning science writer from Portland, ME, has written for *Discover Magazine*, *Science*, and *Nature Medicine*.

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7. Inside the Arctic Circle, the sun rises above the horizon on winter days for only a few hours at most.

AGING

U.S. Lives: Longer but Sicker?

Contrary to society's assumptions that good health will increase with each generation, Americans are living longer but enjoying fewer healthy years. "We do not appear to be moving to a world where we die without experiencing disease, functioning loss, and disability," says Eileen M. Crimmins, a professor of gerontology at the University of Southern California (USC). According to an analysis¹ by Crimmins and USC postdoctoral fellow Hiram Beltrán-Sánchez, between 1970 and 2005 the probability that a person aged 65 would live 20 more years doubled to 40%, primarily because of decreases in death from cardiovascular disease and cancer. However, average years spent living with morbidity² also increased.

The analysis showed that a man who was 20 years old in 1998 could expect to live about 55 additional years, spending about 10 of those years with serious disease and 3.8 with limited mobility. In contrast, a man who was 20 years old in 2006 could expect to live longer still (56.1 additional years) but spend more time with disease (12.3 years) and lack of mobility (5.8 years). Women's average life spans, although still about 5 years longer than those of men, increased at a slower rate than men's, while their years of morbidity increased at a higher rate.¹

The United States lags behind many countries in increasing longevity. In 2010 the country ranked just 49th among world countries in life expectancy at birth.³ Crimmins and Beltrán-Sánchez note that recent increases in length of life in the United States have been caused more by improvements in treatments for disease than in disease prevention.¹ For example, age-adjusted incidence of diagnosed diabetes⁴ doubled between 1980 and 2008 for both men and women.⁵ The authors state that only delaying the onset of disease through preventive care will lead to longer disease-free lives.¹

However, "the reality is that prevention is not always easy and not always the best expenditure of money," cautions David O. Meltzer, chief of hospital medicine at the University of Chicago. "Extensions of life

expectancy lead to cost. We need to keep this in mind when evaluating cost-effectiveness. If we don't, we may invest too much in things that extend the length of life and not enough on things that improve quality of life." Avoiding difficult conversations about such matters, he adds, means "we will make mistakes, and we will be less healthy for it."

Reducing exposure to pollutants may be one way to decrease morbidity and mortality. Crimmins and colleagues are analyzing the health impacts of exposure to air pollution, which Crimmins says is a clear risk factor for heart disease and cognitive loss. According to a study by the World Health Organization (WHO), exposure to coarse particulate air pollution above the WHO guideline of 20 $\mu\text{g}/\text{m}^3$ annual mean caused an estimated 40,600 U.S. deaths in 2006.⁶

"At a time when we are all concerned about reducing climate change, it is remarkable that in many cities it is cheaper and more efficient to drive to work than to use public transport," says Carlos Corvalan, a coauthor of the WHO analysis and a senior advisor on risk assessment and global environmental change for the Pan American Health Organization. "Addressing this single issue would go a long way in reducing emissions that cause air pollution and respiratory diseases in addition to reducing greenhouse gas emissions and climate change."

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The Beat

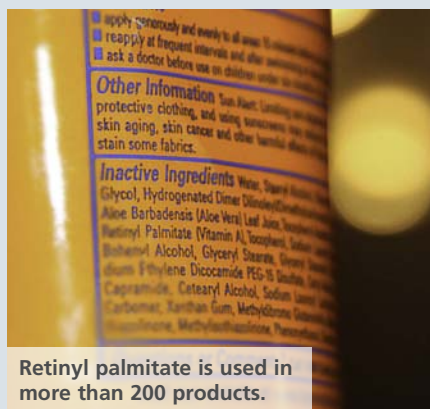
by Erin E. Dooley

Sunscreen Ingredient Linked to Skin Tumors

An independent science advisory board voted in late January 2011 to confirm a draft National Toxicology Program (NTP) assessment¹ that concluded retinyl palmitate promotes the development of skin tumors and lesions when applied to the skin in the presence of sunlight. Retinyl palmitate, a form of vitamin A, is used as an anti-aging ingredient in more than 200 sunscreens and other personal care products. In 2010 the Environmental Working Group published an analysis of the NTP's raw study data that drew the same conclusions.²

Clorox Discloses Ingredients

In a significant first for a mainstream manufacturer, the Clorox Company has announced it will disclose not only the active ingredients but also specific preservatives and dyes used in each of its cleaning, disinfecting, and laundry



Retinyl palmitate is used in more than 200 products.

products.³ The company has also published a roster of fragrance ingredients used in its products (although they are not linked to specific products). Going forward, Clorox product labels will direct consumers to a website where they can find ingredient lists plus Material Safety Data Sheets for formulated products. Manufacturers are

not required by the Consumer Product Safety Commission (which regulates cleaning supplies and laundry products) to list either the term "fragrance" or fragrance ingredients on labels or Material Safety Data Sheets.⁴

Traffic Noise and Stroke Risk in Older Adults

A study of more than 57,000 Danish residents over age 50 has revealed an association between exposure to loud traffic noise and increased risk for stroke.⁵ For every 10-decibel increase in estimated road traffic noise, the relative risk of stroke rose 14% overall and 27% among people over age 64.5 after adjusting for multiple stroke risk factors. Sleep disturbances can contribute to cerebro- and cardiovascular risks, and elderly people are already more susceptible to broken sleep, which could help explain why the association was strongest among the oldest participants.

LAWS, REGULATIONS, AND POLICY

New Food Safety Law Brings Opportunities Amid Hurdles

When President Obama signed the FDA [U.S. Food and Drug Administration] Food Safety Modernization Act¹ into law on 4 January 2011, it marked the farthest-reaching changes to the U.S. food safety system in more than 70 years. Crafted in light of concern over foodborne disease outbreaks and perceived underinvestment in food-inspection capacity,² the law combines a mandate for more FDA inspections with authority to respond quickly to illness outbreaks.

"The bill fundamentally restructures the way FDA monitors the food supply," says Caroline Smith DeWaal, director of food safety at the nonprofit Center for Science in the Public Interest. "FDA's oversight role is greatly enhanced." The agency also has enhanced authority over imported processors, a growing source of the U.S. food supply. She notes the law sets new standards for on-farm production, particularly certain high-risk fruits and vegetables.³ The FDA shares responsibility for food safety with U.S. Department of Agriculture (USDA), which handles poultry, meat, and certain egg products.

On the other hand, the law doesn't mark a huge change in direction overall. Robert Buchanan, director of the Center for Food Safety and Security Systems at the University of Maryland, explains that the new law gives FDA "some additional powers for when the industry isn't doing what it's supposed to be doing." These include setting limits on key food pathogens, better surveillance, and more capacity for inspections and investigations following illness reports.

The bill lays out a combination of producer performance standards and government inspections designed to ensure those standards are upheld. It sets a goal of "not fewer than 4,000 field staff members in fiscal year 2011 to carry out food-related activities," according to FDA spokesman Douglas Karas. Last year's budget allowed for about 2,800 full-time staff for field activities related to food, supplemented by other staff.

Despite the law's call for more inspectors and more frequent inspections, with the new Republican Congress vowing to slash federal budgets, Buchanan says, "Frankly, USDA and FDA will be lucky to keep the number of inspectors they already have. It's a real concern." The FDA declined interview requests, saying it's still studying the new law and exploring partnerships with other agencies and watchdog groups.

The new law leaves it to industry to decide which technologies to use to track outbreaks and manage tracking data. "Frequent shopper" cards used by grocery stores to track customers' preferences may help. Some stores' cards track food lot numbers, and they have led to recalls in some cases, according to David Goldman, assistant administrator for the Office of Public Health Science at the USDA Food Safety and Inspection Service.

Some experts expect what the *Washington Post* called "a small gold rush" among tech companies anticipating a growing market in new food-tracking technologies.⁴ The California-based company YottaMark, Inc., for example, markets the HarvestMark system, which lets consumers scan produce labels using an iPhone app or type in tracking numbers online to learn precisely where the produce was grown and when it was harvested. HarvestMark is currently used by 200 companies.

Will the new law reform the system? Time will tell. "This is always going to be an evolving activity," Buchanan says. "But do I think this law is going to have a big impact? Yes. Huge."

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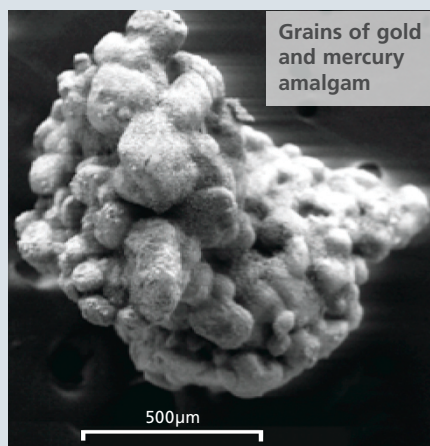
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California Mercury Sediments: Let Sleeping Dogs Lie . . . for Now

Some California waterways are contaminated with mercury-laden sediment, a remnant of the state's gold mining legacy. Although the mercury-contaminated sediment poses little threat if it remains buried, disturbed sediment can release inorganic mercury that can convert to toxic methylmercury. A feasibility study predicts that removing such sediment with current suction-dredging technology would exacerbate the mobilization of mercury—fine-grained sediment particles are the sediment fraction with the greatest mercury concentration as well as the most likely both to elude standard recovery equipment and to travel far downstream.⁶

Updated Guidance on CFL Cleanup

The U.S. EPA recently released updated its guidance for consumers on preventing breakage of mercury-bearing compact fluorescent lamps (CFLs) as well as storage, handling, usage, and cleanup of hard surfaces and carpets.⁷ Among



Grains of gold and mercury amalgam

other revisions, the EPA now advises consumers to wait 5–10 minutes after a bulb breaks before cleaning it up, rather than the 15 minutes recommended in earlier agency guidelines. This change is based on a 2008 study showing that most of the mercury in broken CFLs was released within 5 minutes.⁸

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